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MEDICAL NEWS LETTER

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MEDICAL NEWS LETTER

Policy

The U. S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

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Change of Address

Please forward changes of address for the News Letter to: Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md., giving full name, rank, corps, and old and new addresses.

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Air Travel in Cardiorespiratory Disease

Passenger transport by air is rapidly expanding. Although advantages for normal people are obvious, there is some hesitancy in encouraging air travel for persons who are suffering from a number of disease processes. Of these groups, the most important are patients with cardiorespiratory disease. In these patients, altitude exposure is considered to be the major problem, although other factors, such as psychologic factors, noise and other similar characteristics of air travel are important. It must be remembered that the mortality from cardiorespiratory disease per passenger mile traveled by air is far below that of rail or bus transport at the present time.

From published data, it is apparent that exposures above 5000 feet in altitude are commonplace in pressurized aircraft and that in jet transports these may at times be somewhat higher. It is fair to say that 10,000 feet cabin altitude will seldom be exceeded except where an emergency occurs or where an accident, such as decompression of the aircraft, occurs. When such an internal altitude is exceeded, it is required by law that additional oxygen be supplied.

Of greater importance is the question of standard operating practice among commercial airlines. It may be desired in extremely hot weather to decompress the plane as rapidly as possible after takeoff to a cabin altitude of approximately 9000 to 9500 feet. This has the effect of allowing a rapid reduction of the internal cabin temperature and increasing the comfort of the passengers. However, such an exposure might be a serious matter were certain patients with cardiorespiratory disease aboard. A second factor is that there is no automatic turning on to the maximum differential pressure, but a gradual reaching of the final pressure at cruising altitude.

In this report, concern is not with operational variables, but with the concept that, if the maximum differential pressure between external and cabin altitude is reached and maintained throughout a flight and no untoward happening should occur, how would those people who should travel in a given route on given equipment be separated from those who should not.

Physiologic Considerations of Altitude

Results of study of what occurs at various altitudes to the pulmonary capillary saturation is based on the premise that the patient is resting quietly in his seat and is breathing in such a way as to reach a steady state with a respiratory quotient of 0.8. It is further assumed that there is an all or none situation operating in the alveoli—that alveolar air and pulmonary capillary blood either completely come into equilibration, or do not come into equilibration at all. Such a patient is considered as having various alveolar CO_2 tensions.

Those most seriously disabled by altitude will be patients in whom there is CO_2 retention or a marked alveolar capillary block. As well, the

patient who is unable to hyperventilate will be unable to produce a fall in his CO_2 tension which will result in a rise in his pulmonary capillary saturation. On the other hand, such problems as fixed cardiac output in the absence of other factors will not be of great importance. Restricted coronary blood flow may be of importance or not, depending upon the ability to hyperventilate and reduce the alveolar CO_2 tension.

Clinical Assessment of Suitability for Air Transport

In patients with cardiopulmonary disease, nature and severity of symptoms, physical findings, radiologic findings, and in doubtful cases, certain chemical tests, make possible an adequate evaluation of altitude tolerance.

Chronic pulmonary emphysema—In this condition, presence of acidosis or impending acidosis is a relatively strong contraindication to altitude exposure. The important factors relative to these patients are the well known hazards of uncontrolled oxygen administration by unskilled personnel, and the low pulmonary capillary blood oxygen saturations which may occur. If cyanosis is present, altitude exposure must be limited to 3000 or 4000 feet. In the emphysematous patient without acidosis, the problem is less serious unless marked cyanosis is present.

Restriction of ventilation—In this condition as caused by pulmonary or pleural fibrosis, it is necessary to consider the effect of ventilatory restriction upon arterial oxygen saturation. In contradistinction to obstructive emphysema, it is safe to use added oxygen in these cases and respiratory acidosis is not a problem except in advanced cases. The important factor in cases of restricted ventilation is presence of cyanosis or arterial desaturation.

Alveolar capillary block—In these patients, there is a calculable lowering of the pulmonary capillary saturation. These patients may be divided for purposes of altitude tolerance into two groups: the first can increase ventilation and the second cannot. It is safe for these patients to receive added oxygen throughout the exposure.

Coronary artery disease—In these patients, with suspected disease or with disease combined with restricted ventilation, it is a matter of considerable concern that the arterial oxygen saturations should not diminish during air travel. Such patients are naturally candidates for administration of oxygen together with limited time exposure to the higher altitudes. In general, no patient should be allowed to become altitude-hypoxic within 8 weeks of an acute coronary occlusion, nor should a patient with angina fly without a supply of oxygen sufficient to restore the inspired oxygen tension to sea level or better.

Anemias—These patients must be considered in relation to cardiac function, except for sickle cell anemia which presents its own specific problems.

Cardiac disease (without failure, with cyanosis)—In these patients, the problem is to maintain the pulmonary capillary saturation by added oxygen.

Ventilatory restriction is the most important coexisting disease contra-indicating air travel. This group includes patients with arteriovenous shunts.

Cardiac failure—In patients who are in impending or actual cardiac failure, particularly on the left side, the pulmonary capillary saturation may fall easily and its maintenance is essential. The presence of any ventilatory restriction in such patients—which is a remarkably likely thing to occur should left-sided failure start to appear—is a fairly severe contraindication for air travel except with added oxygen from the beginning.

From this discussion, it seems clear that the disease and its severity is the important factor in deciding about air travel. Further, the factor of ability to increase ventilation, the possibility of depression of respiration by added oxygen, presence or absence of cyanosis, and other factors must be considered in making an estimate of the altitude tolerance and duration of exposure. The altitude at which the patient is living must be given due consideration.

Suggested Approach of the Physician

It is clear that a positive recommendation as to safety would provide a difficult legal situation should, in fact, an accident occur after a recommendation had been made that any given altitude was safe for a specific patient. For this reason, the negative approach is thought desirable—"Mr. Doe should not be exposed to an altitude exceeding blank feet."

Arbitrary cabin altitude exposures are:

I.	Up to 10,000 ft.	Unpressurized aircraft
II.	Up to 8000 ft.	Boeing 707; 720 Canadaire: Argonaut; CL-44 DeHavilland: Comet 4; Dove Douglas: DC-6 & 6B; DC-8 Fairchild: F-27 Lockheed: Constellation Martin 404 (in flights over 300 miles) Vickers: Viscount (cruising at 30,000 ft.)
III.	Up to 6000 ft.	All Jets flying at lower altitudes than maximum Boeing 377 Britannia 100 in winter Convair 240; 340; 440; 880 Douglas: DC-7 Lockheed: Super C, G, H; Electra Martin 404 (in flights under 300 mi.)

IV.	Up to 4000 ft.	Britannia 100 in summer; Britannia 300 DeHavilland: Comet 4A Vickers: Viscount (cruising at 15,000 ft.)
V.	Up to 2000 ft.	Certain of above aircraft flying lower altitude routes

Limit I—No patient with suspected or symptomatic cardiorespiratory disease should be exposed to this altitude.

Limit II—Patients with mildly symptomatic disease without cardiac failure or marked ventilatory restriction should not be exposed above this altitude.

Limit III—Recent myocardial infarction, clinical angina, and sickle-cell anemia contraindicate travel above this limit; individual supplementary oxygen supplies should be available. This should be continuously available during stops at such airports as Denver where the altitude exceeds 4000 feet. This also applies to patients with alveolar capillary block who are cyanotic, and to patients with pulmonary emphysema in whom only one of the triad of clinical cyanosis, cor pulmonale, or respiratory acidosis is present.

Limit IV—This limit applies to patients in Limit III where oxygen is not being carried, to those with more severe cardiac disease with marked cyanosis or recent decompensation, and to patients with pulmonary emphysema or other restrictive ventilatory disease in whom two of the triad of clinical cyanosis, cor pulmonale, or respiratory acidosis are present.

Limit V—This limit applies to patients with cardiac disease in failure, restrictive ventilatory disease with all three manifestations, and myocardial infarction of less than 8 weeks duration.

It is recommended that airlines should be informed of the limit set by the physician at the time of purchase of the ticket. When necessary, the medical department of such airlines can be consulted. In general, medical personnel of the airlines show considerable willingness to cooperate in these matters. (Committee on Physiologic Therapy, American College of Chest Physicians, Air Travel in Cardiorespiratory Disease: Dis Chest, XXXVII: 579-588, May 1960)

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Myocardial Infarction in Women

Scarcely any medical dictum concerning arteriosclerosis and its complications is as deeply entrenched as that relating to the great prevalence of acute myocardial infarction in men as opposed to women. Recent study failed to demonstrate this difference in sex incidence in autopsies performed at Washington University, 1940 - 1954. Other recent autopsy studies also indicate that the supposedly greater susceptibility must be reevaluated.

With this purpose in mind, the authors added to the analysis of autopsies from Washington University those of two other large series from widely separated areas—Massachusetts General Hospital in Boston, and Radcliffe Infirmary in Oxford, England. The results confirm that the incidence of acute myocardial infarction in autopsy populations is now similar in the two sexes.

Of 9785 patients over 50 years of age who were autopsied, no statistically significant difference was found between the numbers of acute myocardial infarct in men and women (ratio 1.02:1). Among 3700 patients under 50 years of age, a highly significant sex difference was found (ratio 2.87:1, male to female). Even in this younger age group, the difference in incidence between men and women is less than the over-all difference in incidence for all age groups as given in standard medical texts. These data suggest a trend in the changing epidemiologic characteristics of acute myocardial infarction in autopsy series.

A hospital clinician or pathologist who is not aware of the predominance of men among his patients might easily be misled in his estimate of the sex incidence of a disease by the absolute number of men seen in his selected practice. A predominance of men is almost always present in an autopsy series, but in the present study was also found among hospital discharges in all groups except that of patients below the age of 50 who were discharged alive.

The only striking difference in incidence of acute myocardial infarction between the two sexes is found in patients discharged alive. In this group, the over-all incidence in men was 3.5 times that in women; but when only patients under 50 years of age were considered, the ratio of men to women was 12:1, a startling difference in comparison with that found among the autopsied patients in the same age group (2.12:1), as well as among patients discharged dead with only a clinical diagnosis (2.2:1). This remarkable preponderance of men discharged alive with clinically diagnosed acute myocardial infarction—six times as great a ratio as that found in autopsied patients in the same age group—suggests at least two possibilities: (1) the disease is more likely to be fatal in women, or (2) the diagnosis is less obvious in young women than in men, perhaps solely because the possibility of the diagnosis is not often entertained in young women.

That the first explanation is unlikely is suggested by the equal incidences of healed infarcts found in the two sexes in previous studies. The second possible explanation is more likely correct for there exists a greater clinical suspicion of this disease in men than in women. This factor would be most likely to operate when the disease is mild, nonfatal, and therefore, difficult to diagnose. It is important that the similar incidence of acute myocardial infarction in men and women be recognized because the data indicate that many women have not had the benefit of an accurate clinical diagnosis, or that the diagnosis is being made too frequently in men, or both. (F. Goodale, W. A. Thomas, R. M. O'Neal, Myocardial Infarction in Women: AMA Arch Path, 69: 599-604, June 1960)

Primary Interstitial Pulmonary Fibrosis

Credit for recognition of primary interstitial pulmonary fibrosis (PIPF) belongs to Hamman and Rich who reported four cases in 1935. They observed the pulmonary lesions in different stages of development and believed that it did not begin simultaneously throughout the lung, but spread to involve all lobes. They observed localized forms, and considered localized fibrosis encountered at autopsies to belong to this disease.

Greater use of lung biopsy has permitted better understanding of the sequence of events from the early stages to almost complete fibrosis of the lung parenchyma. This understanding is extremely important inasmuch as a similar histologic picture may be seen in such conditions as pneumoconiosis, collagen disease, long-standing chronic passive congestion of the lungs, congenital dysplasia of the lungs, pulmonary adenomatosis, sarcoidosis, radiation pneumonitis, histiocytosis, obstruction of pulmonary veins, rheumatoid and rheumatic diseases, and following the use of hypotensive drugs.

Clinical Features

Clinical manifestations of PIPF vary considerably. In some patients, the prodromal period varies from a few days to several years, and is characterized by vague general symptoms, such as anorexia, weakness, weight loss, easy fatigability, and slight dyspnea. Earliest manifestations are dyspnea, cyanosis, and cough. In addition, there may be fine scattered rales over the lungs and clubbing of the fingers.

An important factor in diagnostic error is the great discrepancy in roentgenographic findings, subjective symptoms, and paucity of physical findings. The roentgenogram may be normal, but more often there are nonspecific reticular and nodular shadows or areas of opacity simulating pneumonic consolidation. However, these changes may appear in only one lobe or segment.

The disease may explode as a rapidly fatal condition or may follow a chronic protracted course. Basically, however, it is a chronic process. Patients reported as having acute disease may have presented an inaccurate history, or may have been seen in the terminal stage. The usual clinical course is one of deterioration of pulmonary reserve. The terminal event is respiratory insufficiency, right-sided heart failure, or a combination of both.

Pathogenesis

Chronic PIPF occurs most often in young adults, but there is no sex or racial preponderance. Viral infections have been considered by some as the most probable etiologic factor, although evidence has been advanced

against this concept. Another suggestion is that the disease might be produced by a chronic obstruction of lymph flow because changes in the lung bear a resemblance to spontaneous or experimentally produced lymphedema and elephantiasis. Others have suggested that the disease may be a sequence of several attacks of interstitial pneumonia with lack of fibrinolytic enzymes and failure of absorption of the inflammatory exudate.

An "allergic" etiology was suggested by Hamman and Rich. Many features suggest that development of this condition is based on an immune mechanism. Eosinophils in the pulmonary lesions are compatible with such an allergic response. The lung lesions in PIPF are identical with those in some patients with rheumatoid disease and rheumatic heart disease, and resemble those in such diseases as polyarteritis nodosa, lupus erythematosis, and scleroderma. A familial tendency may reflect a genetically influenced mode of tissue hypersensitivity reaction. The beneficial response of some patients to adrenal steroids is consistent with an immune mechanism.

Pathology

The disease is essentially interstitial and alveolar in location. Both the diffuse and circumscribed forms have similar histologic features. The condition is characterized by an extreme variety of microscopic patterns including edema, fibrinous exudate, mononuclear cell infiltration of the septa, and focal hemorrhage to the most extreme grade of fibrosis and interstitial collagenous deposition.

Despite the large number of diseases responsible for pulmonary fibrosis, it is only possible to arrive at a clinical diagnosis when all diagnostic means, including appropriate pulmonary function studies and lung biopsies, are used. The disease which can most closely simulate this condition is pulmonary adenomatosis.

Pulmonary Function Studies

Studies of patients with PIPF reveal diminished vital capacity amounting to one-half to one-third of normal values. It is reasonable to assume that the major cause of the reduced vital capacity is due to a decreased number of alveoli and to limitation of expansion secondary to fibrosis of large areas of the pulmonary parenchyma.

Arterial oxygen desaturation is evident, probably because of hypoventilation, impairment of diffusion, uneven ventilation related to blood flow, or venous to arterial shunts.

Impairment of alveolar-capillary diffusion for oxygen has been demonstrated in patients having clinical, x-ray, and biopsy evidence of pulmonary fibrosis of various etiologies other than Hamman-Rich disease. Some investigators conclude that these abnormalities are the result of extensive destruction of pulmonary capillaries.

Therapy

Before 1952, treatment of chronic PIPF was usually symptomatic, consisting of expectorants and antitussive agents. In 1952, adrenal steroids were introduced along with the increased use of lung biopsy as a diagnostic measure.

The rationale for use of adrenal steroids is based upon its anti-inflammatory and anti-exudative effect. Beneficial effects have been reported in those patients in whom the disease process was in a relatively early stage. Once fibrosis becomes established, it appears to be irreversible and the patients receive only temporary benefit.

If the disease is due to a hypersensitivity reaction, steroid therapy would be indicated. Steroids probably do not alter the stimulating factors, but simply alter the tissue response of the host.

To realize the full beneficial effects of adrenal steroid therapy, it is imperative to make the diagnosis early. Because clinical manifestations are so varied, it is worthwhile to resort to lung biopsy more often for early diagnosis.

Judging from previously reported cases and the authors' series, the current treatment of choice continues to be use of adrenal steroids, even though the effect in many cases may be negligible. Because of the risk of precipitate death following discontinuance of steroids, as experienced by the authors, it is considered necessary to continue such therapy indefinitely once it is undertaken. (C. M. Baglio, R. D. Michel, W. C. Hunter, Primary Interstitial Pulmonary Fibrosis - Diffuse and Circumscribed Forms: J Thor Cardiov Surg, 39: 695-715, June 1960)

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Internist's Responsibility in Surgical Infections

Increasing risk of serious infection follows many of today's surgical procedures. Some causes are: (1) acceptance of more hazardous risks for surgery in situations where it has previously been denied; (2) increasing hospital concentration of antibiotic-resistant bacteria; (3) more surgery in areas where serious disturbance of vital functions is readily produced; (4) more "medical surgery" by multiple punctures, aspirations, et cetera; (5) use of more drugs designed to allay patient's pain and anxiety which at the same time may carry side effects capable of reducing the patient's resistance to infection.

Add these factors to the chance for bacterial invasion provided by the surgery itself—the period of major contamination from within the body and from its surgical surroundings; reinforce this further with the reduced resistance resulting from the disease for which the surgery is done, and the sum proves to be increasingly formidable.

One price a surgeon may pay in performing the increasingly intricate work of today is to spend more and more time on technical details. This leaves less opportunity for attending to factors which may contribute to infection; it is in this area that the internist may properly assume a new role for which he is well prepared—concern with infections.

Anticipation

Successful treatment starts with prompt diagnosis dependent, in turn, on intelligent anticipation. General factors which appear to facilitate infections are sometimes lost in the hurried preparation for the main event. An internist is in a particularly good position to recognize these factors, and by so doing, anticipate trouble. Some considerations effective in preventing infection are:

(1) Proper choice of the surgeon when this is possible. The surgeon who achieves speed at the cost of trauma, contamination, poor suture lines, and bleeding has no place when the risk of infection may be high.

(2) Familiarity with the patient's personality. A level-headed person will far outdo his panicky neighbor who wastes energy, freezes peristalsis, and over-demands medication in his concern.

(3) Check for diabetes, heart disease, or nephritis in preoperative survey along with more subtle points, such as diminished red blood cell mass. Attention to items such as the latter may avoid excessive liability to the development of shock with its greater chance of infection.

(4) Evaluation of possibility of hypogammaglobulinemia in face of history of repeated infections.

(5) Awareness of recent x-ray therapy and concurrent use of steroids.

(6) Cognizance of surgery in the presence of established inflammatory reaction.

(7) Consideration of age because physiologic senescence carries both low resistance to infection and often diminished evidence of its presence.

(8) Attention to factors productive of susceptibility to shock.

(9) Anticipation of problems incident to use of certain mechanical factors, such as casts, binders, drains, et cetera, and prolonged abnormal positioning.

(10) Preoperative bacteriologic study when indicated.

(11) Determination of any antibiotic incompatibilities.

Diagnosis

Prompt diagnosis is mandatory if the collapse caused by unchecked increase in bacterial numbers and toxins which often characterize a serious infection is to be avoided. Three considerations will help the internist make a diagnosis:

(1) Precise account of the surgical procedure and coincident occurrences, and knowledge of the patient's preparation for surgery and complications of anesthesia.

(2) Clear summary of the entire postoperative period, best obtained by first-hand observation.

(3) Examination of the patient and his records.

Treatment

Despite most energetic efforts, the perfect antimicrobial agent does not yet exist. Nonetheless, in many ways the antibiotics are true miracle drugs and as such may create major problems by inspiring unjustified confidence in themselves. Antibiotic treatment will commonly fail when body defenses are inadequate; steps needed to maintain their adequacy are a particularly suitable and proper responsibility for the internist.

Some general principles regarding treatment are:

(1) Prescribe antibiotics in maximum allowable doses from the initiation of treatment; "working-up" is to invite failure.

(2) Exercise care to insure that the drug comes in contact with the bacteria.

(3) When infection persists, repeat bacteriologic evaluation every 4 to 8 days to detect new or drug-resistant organisms.

(4) Protect certain body functions—blood pressure, red cell mass, and urinary output.

(5) Detect toxic effects of antibiotics.

(6) Avoid premature discontinuance of antibiotics. Tapering off treatment is preferred to sudden discontinuance of the agents.

(7) Reassess the plan of treatment if the patient fails to show distinct improvement within 3 to 5 days; confirm that orders are being properly carried out.

(8) Share with the surgeon responsibility in detecting situations when further surgical intervention is required.

(9) Treat for both staphylococcus and staphylococcus in combination with one or more of the gram negative organisms until their absence is proved and the true invaders identified. Continue to anticipate their appearance as superinvaders so long as the patient remains in the hospital. (Opinions on this point vary strongly. —Ed.)

(10) Use bactericidal antibiotics in preference to broad spectrum agents, avoiding penicillin and streptomycin because of frequency of resistance. When the infection is serious, neomycin and chloramphenicol in combination, or neomycin and erythromycin in combination, all in full doses, should be used. More recently, kanamycin with erythromycin has been used with good results. Spontin should be reserved for pure staphylococcal infections resistant to all other antibiotics. Polymixin is to be used when Pseudomonas is identified.

(11) Do not delay the start of treatment, it is dangerous. A shrewd clinical surmise relating the bacteria most likely to be found in a particular site of infection and the bacteria most commonly found in the hospital with the best antibiotic agent will suffice while waiting for results of cultures and sensitivity tests.

Because ill-conceived prophylactic treatment serves only to suppress and slow the appearance of resistant infections, the author believes that this is another example of delay in a particularly dangerous form—the more treacherous for the false security which accompanies it. (F. P. Foster, The Internists' Responsibility in Anticipation, Dectection, and Treatment of Surgical Infections: The Surgical Clinics of North America, Lahey Clinic Number, 40: 793-799, June 1960)

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The Surgeon's Conscience

The notion that a surgeon is a different breed of man is widely held by the general public and, to a lesser extent, by physicians themselves. The insistence of many British surgeons on the Mister title, the exploitation of the dramaturgic possibilities of the operating room in novels, motion pictures, and plays, and even the deportment of some surgeons tend to emphasize the idea that the surgeon is a little grander, a little more heroic than the average practitioner of medicine. The idea of the surgeon as a sort of superman is, of course, palpably nonsensical, but this should not cause us to lose sight of a valid difference, by no means inherent or consistently present, between surgeons and other physicians. This difference is seldom verbalized and often not appreciated, but certainly deserves notice. The distinction has to do with the physician's reaction to complications and deaths.

If a patient with a "medical disease" is treated with the conventional drugs and then dies, his demise can be dealt with fairly easily. The diagnosis and treatment were apparently correct, but he "failed to respond" and expired. This type of medical fatalism is common, convenient, and understandable. When, however, a patient dies in the early postoperative period, the reaction is apt to be considerably different. The surgeon is almost inevitably afflicted by pangs of conscience, sometimes devastatingly severe. He cannot easily write off the death as a "failure to respond." He must, regardless of the cause of death, ask himself a number of questions: Should the patient have been operated upon? Was he adequately prepared for the surgery? Was the operation correctly chosen and correctly performed? Was the postoperative care adequate? The death (or complication) may well have been inevitable, but the surgeon's conscience has done its work. It has been converted into intellectual energy seeking the cause for the failure.

The medical man is not immune to these pangs of conscience, nor is the surgeon invariably touched by them. The difference is quantitative and is accounted for by the simple act of operating upon the patient. Regardless of the personal relationship between the surgeon and his patient, the process of incising and extirpating creates a tenacious emotional bond between them, and so it should. The incision should never be made without the realization on the part of the surgeon that much more than a mechanical process is taking place. He should be prepared to accept the pain, to intellectualize it, and, furthermore, to profit from it. (M. A. Claman, The Surgeon's Conscience: Surg Gynec Obstet, 110: 749, June 1960)

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Early Treatment of Snake Bite

Although an estimated 2000 to 3000 snake bite accidents occur yearly in the United States, the mortality from this source is not great; only 10 to 20 deaths occur as a result. It is important, however, that bites of poisonous snakes be managed correctly because, in many instances, the possibility of a lethal outcome must be considered and the venom may damage tissues at the site of injection. Treatment should be chosen which, in itself, is least likely to lead to deleterious effects. At times it may prove difficult to determine what part of local tissue damage has resulted solely from the bite and what part has been caused or abetted by the treatment.

One technique for management of bites of pit vipers in North America is incision and suction. Evidence from recent experiments has cast considerable doubt on its value. The obvious disadvantages of this method include possible damage to such important structures as tendons and nerves, hemorrhage, or infection when the incisions are carried out by an inexperienced person. When carried out under ideal conditions, the multiple incisions produced still heal with some degree of scarring. Another technique—initial tourniquet application followed by local cooling of the bitten extremity—has been offered both for first aid and definitive therapy; it has been suggested that tissue necrosis at the site of the bite can be reduced considerably if this technique is employed. This method has been condemned, however, on the basis that local necrosis may be greater with application of cold.

The authors conducted experiments with dogs employing the two techniques with several variations, with and without antivenin.

Whether data obtained from envenomation experiments in dogs are applicable to the human patient has not been proved. However, autopsy studies and clinical observations indicate the lesions produced and the mechanism of death in the two species are similar and some conclusions concerning treatment of patients seem justified. From the authors' experiments, it appears that the local measures studied may be of some benefit in therapy, but the availability of antiserum and period of delay which will occur prior to its

administration probably should determine the place of such local measures in treatment of bites of pit vipers.

Local necrosis produced by venom is not decreased by cooling. In this study, it appeared that tissue destruction at the site of venom injection was equal to and, in most instances, actually greater than in untreated animals; all animals treated by hypothermia alone died after receiving lethal doses of venom. Increase in survival was obtained by interim cooling of an envenomed extremity if antiserum administration was delayed for as long as 8 hours, but no benefit was apparent if antiserum was given within 4 hours of venom injection. Because the local necrotizing properties of venom may be increased by cold, and as hypothermia appears at best to serve only as a temporizing measure, considerable caution should be exercised in treating pit viper bites in this manner. Only potentially lethal bites for which antiserum will be available after a delay of some hours should be treated by this method.

Results of the authors' experiments confirmed that of others, that incision-suction treatment of dogs injected with lethal dosage of Crotalus venom is useless if treatment is delayed for 30 minutes after venom injection. Results were somewhat better if the animals were treated immediately and extensively (average of 15 incisions per limb), but survival rate for this group was no different than for animals treated by antiserum alone after a delay of 4 hours. As this type of treatment is comparable to that which would be carried out by a physician rather than by a layman, circumstances would not often arise where it could be employed without some delay. The same treatment after a delay of 30 minutes proved useless in animal experiments.

Incision-suction is probably of some benefit in treatment of snake bite. However, spreading of venom incident to manipulation and possibility of damage to important structures probably outweighs the value to be gained from first aid measures. There is no evidence that local necrosis is decreased by this measure, and if venom is injected intramuscularly instead of subcutaneously by the striking snake, incision-suction treatment cannot be effective because of fascial barriers. Main reliance in treatment of pit viper bites should be placed on specific antiserum; incision suction treatment should be utilized only in circumstances when no other treatment is available or will not be available for many hours. (Po M. Ya, J. F. Perry Jr, Experimental Evaluation of Methods for the Early Treatment of Snake Bite: Surgery, 47: 975-981, June 1960)

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The Medical Profession will always have to fight against the claims of wrong-headed, and too often dishonest, individuals and "schools" as they call themselves. A fraction of every community will always run after the false prophets.

—Holmes

Jejunal Diverticula - Cause of Gastrointestinal Hemorrhage

Jejunal diverticula may be the origin of acute or chronic hemorrhage from the alimentary tract and should be specifically looked for during the surgical exploration or autopsy of any patient with gastrointestinal bleeding in whom the source of bleeding has not been identified by usual methods of examination.

There are two types of diverticula of the small intestine—congenital and acquired. Congenital diverticula are situated on the antimesenteric margin of the intestine and are true diverticula in that they consist of all coats of the intestinal wall. When present they are usually solitary. Meckel's diverticulum is an example.

Acquired diverticula occur on the mesenteric margin of the bowel and are false diverticula in that they lack the muscular coat of the normal intestinal wall. They consist only of mucosa, submucosa, and peritoneum, and are herniations of the intestinal mucosa through defects in the muscular wall on each side of the midline of the mesenteric surface through which the blood vessels pass. They are pulsion diverticula, probably caused by the intraluminal pressure within that segment of bowel.

The vast majority of jejunal diverticula are the acquired type and are found along the mesenteric border of the bowel. They are most often multiple, sometimes solitary, and frequently are associated with diverticula of the colon and/or duodenum. Only rarely has an associated ileal diverticulum been described. They are frequently confined to one relatively short segment of the intestine—most commonly immediately distal to the ligament of Treitz.

Accurate incidence of jejunal diverticulosis is probably not known. They are difficult to demonstrate even at autopsy or operation. They have been found almost exclusively in persons over 40 years of age and about twice as often in men as in women.

Commonly, uncomplicated jejunal diverticula are either asymptomatic or cause no characteristic symptoms. Surgery, therefore, is reserved for those which develop complications. Recorded complications requiring operative intervention include: acute or chronic obstruction, acute or chronic hemorrhage, foreign body or tumor within a diverticulum, internal fistula formation, intussusception, volvulus, pneumoperitoneum, and macrocytic sprue-like anemia.

Statistics suggest that hemorrhage from jejunal diverticula is an extreme rarity. (The author reports three cases.) Yet there are many histories of exploratory operations for gastrointestinal bleeders at which blood was seen in the intestinal tract without the source having been discovered. Usually, no mention has been made of a special search for jejunal diverticula. It has been demonstrated that jejunal diverticula may easily be overlooked in

a routine exploratory operation unless the bowel is distended with air or compressed between occluding fingers to bulge them into view.

Even when jejunal diverticula have been found and demonstrated by operation to have been the source of bleeding, the actual bleeding point has been demonstrated in the excised specimen in only a few instances, although the clinical course has confirmed the correctness of the observation. A more meticulous and magnified view might have revealed others. Nevertheless, the mere presence of jejunal diverticula should not necessarily imply that they are the source of hemorrhage because the majority are not complicated by bleeding. (R. T. Shackelford, W. Y. Marcus, Jejunal Diverticula - A Cause of Gastro-Intestinal Hemorrhage: Ann Surg, 151: 930-938, June 1960)

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IN MEMORIAM

Annis, Robert N., CWO2 MSC USN (Ret)	
Corona, Calif.	26 April
Myers, William W., LT MSC USN (Ret)	
USAF Hospital, Portland, Ore.	4 May
Silvis, Richard Shippen, RADM MC USN (Ret)	
U.S. Naval Hospital, Oakland, Calif.	5 May
Brown, Warwick Thomas, RADM MC USN (Ret)	
Washington, D. C.	16 May
Campbell, Joseph Robert, CWO USN (Ret)	
U.S. Naval Hospital, St. Albans, N.Y.	18 May
Hodde, Joseph Louis, LT HC USN (Ret)	
Pawtucket, R.I.	23 May
Johnson, Truman James, W-2 HC USN (Ret)	
Easley, S.C.	30 May
Ball, Frederic Oscar, LCDR MSC USN (Ret)	
U.S. Naval Hospital, Oakland, Calif.	30 May
Lawrence, Allen, CWO MSC USN (Ret)	
U.S. Naval Hospital, Portsmouth, N.H.	7 June
Glancy, Evelyn O., LCDR NC USN (Ret)	
Kansas City, Mo.	13 June
May, Henry Agett, CAPT MC USN (Ret)	
U.S. Naval Hospital, Bethesda, Md.	21 June

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If you will think about what you ought to do for other people, your character will take care of itself. Character is a by-product. —Woodrow Wilson

Applications for Training in Civilian Institutions

In view of the need for early commitment with civilian institutions for enrollment in training programs to begin in the summer and fall of 1961, interested Medical officers are urged to submit their request for such training to the Chief, Bureau of Medicine and Surgery, prior to 31 August 1960. The types of training programs available are:

Thoracic Surgery (certification by American Board of Surgery required)

Plastic Surgery (completion of 3 years of General Surgery required by American Board of Plastic Surgery; completion of 4 years of General Surgery required by BuMed)

Public Health (leading to Master's or Doctor's Degree in Public Health

Occupational Medicine (leading to Master's or Doctor's degree in Public Health—in Industrial Health)

Radiobiology

Subspecialties of Internal Medicine: Gastroenterology, Hematology and Allergy (completion of Part I, American Board of Internal Medicine preferred)

Medical Instrumentation (extensive background in mathematics required)

Officers may indicate three choices of institutions for training, in order of preference. However, the Bureau of Medicine and Surgery will make final arrangements for enrollment after approval of the request has been obtained.

Applicants may contact institutions relative to training, but in correspondence or interviews, it should be made clear that acceptance would be contingent upon approval by the Bureau of Medicine and Surgery. Applications from career Medical officers qualified to enter these programs should be made by official letter to Chief, BuMed, via chain of command, in accordance with BuMed Instruction 1520.10A. Only a limited number of individuals will be sponsored in these programs in view of the existing personnel shortage.

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Postgraduate Short Courses at AFIP

A series of courses for Medical Corps officers is being sponsored by the Armed Forces Institute of Pathology, Washington, D. C. during fiscal year 1961. Naval Medical officers eligible to attend are those who meet the criteria prescribed by BuMed Instruction 1520. 8. Requests for attendance should be forwarded via official channels, addressed to the Chief, Bureau of Medicine and Surgery, to be received in the Bureau at least 8 weeks prior to the beginning of the course requested. Travel and per diem orders will be authorized to the extent that Bureau funds are available for those approved for attendance.

Courses	Dates
Orthopedic Pathology	31 October - 9 December 1960
Forensic Sciences Symposium	8 - 10 November 1960 & 2 - 4 May 1961
Forensic Pathology	23 - 27 January 1961
Ophthalmic Pathology	13 - 17 March 1961

NOTE: The Armed Forces Seminar in Obstetrics and Gynecology will be held at the Brooke Army Medical Center, San Antonio, Texas, 17 - 20 October 1960. Requests for attendance at the Seminar should be submitted in accordance with above instructions.

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Armed Services Orthopedic Seminar

Walter Reed General Hospital will act as host for the Army Medical Service in conducting the Second Armed Services Orthopedic Seminar at Walter Reed Army Medical Center, Washington 12, D. C. 26 - 28 October 1960.

The material to be presented at the Seminar is especially selected to cover the problems of common concern most frequently encountered by orthopedic surgeons of the Armed Forces. Presentations will also give the results of clinical research projects jointly conducted by the three services during the preceding year.

All orthopedic surgeons and orthopedic Residents on active duty in the Armed Services are eligible to attend.

Eligible and interested officers should forward requests to Chief, Bureau of Medicine and Surgery, via chain of command, in accordance with BuMed Instruction 1520. 8, at least 8 weeks prior to commencement of the seminar. Travel and per diem orders chargeable against Bureau funds will be authorized for attendance contingent upon availability of funds.

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NOTE: In the News Letter, Vol. 35, No. 12 (17 June 1960), in referring to BuMed Notice 6230 on p. 21, the wording might imply that all naval personnel were to be immunized. The exact meaning is that all personnel are to be immunized in accordance with requirements of BuMed Instruction 6230. 1B which provides for certain exceptions and waivers.

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Declassification of Documents

In consonance with the intent of OpNav Notice 5500 of 12 December 1959, to remind on a continuing basis all officers and civilian employees of the Navy Department who create classified documents or are responsible for subsequent declassification of the burdens resulting from over classification or failure to declassify, the following points to be considered are given:

1. Keep in mind how careful you must be when you are called on to work with a classified document, and how annoyed you are when you feel that the document shouldn't be classified so highly, if at all. You can simplify handling of documents by pin-pointing evidence of over-classification and recommending that declassification or down grading actions be taken.

2. Do you have in your custody classified material which may be subject to declassification under the terms of Army Cir. 380 3; OpNav 5500.40; AFL 205 3, which affected a large bulk of classified documents dated prior to 1 January 1946? If this material has been so declassified but has not been so marked, it should be marked as soon as practicable. If it does not require protection, it is taking up space in costly safes.

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American Board Certifications - Active Duty

American Board of Neurological Surgery
CDR Leland C. Brannon

American Board of Obstetrics and Gynecology
CDR Francis W. Burke, CDR James P. Semmens,
LCDR Richard B. Speaker

American Board of Ophthalmology
LT Robert C. Drews (USNR), CDR Anthony J. Guida,
LT Ralph L. Hadlund

American Board of Pathology
LCDR Vincent J. Hyams

American Board of Pediatrics
LT Ray L. Peacock Jr. (USNR)

American Board of Plastic Surgery
CDR William C. Trier

From the Note Book

Graduation at NSHA. RADM B. W. Hogan, Surgeon General of the Navy, presented certificates to forty-one graduates of the U. S. Naval School of Hospital Administration on 23 June 1960. The class was composed of thirty-eight Medical Service Corps officers, one Royal Canadian Air Force officer, one Royal Canadian Naval officer and one Republic of Korea Naval officer. The exercises concluded 10 months of intensive instruction designed to train personnel for assisting commanding officers of Naval Hospitals in the constantly changing and increasingly complex area of hospital administration. LT Chester A. DeCesaris MSC USN was presented the Surgeon General's annual award for scholastic achievement. (PIO, NNMC)

Medical-Dental TV Workshop. Recently, a Medical-Dental Television Workshop was conducted at the National Naval Medical Center, Bethesda, Md. This project brought together an outstanding number of knowledgeable people who have considerable experience in medical and dental applications of television. In addition to medical and dental activities of the Department of Defense, Veterans Administration, and the Department of Health, Education, and Welfare, various medical and dental schools and colleges throughout the United States were represented. (TIO, BuMed)

Astronaut Training. During May, the astronauts and the Medical officers of the Mercury Space Task Group underwent a 3-week program with the centrifuge at the Aviation Medical Acceleration Laboratory, Johnsville, Pa. This extensive program involved use of individual couches, reduced pressure environment, pressure suits, instrument panel, and composed loop computer system. It was the most complete training and simulation program to that time. (TIO, BuMed)

Handbook of the Hospital Corps (1960). The Government Printing Office announces that subscriptions to the Handbook of the Hospital Corps, now undergoing extensive revision, are available to the general public or to service personnel desiring their personal copy, for $10 ($12. 50 to a foreign address). The subscription service will consist of a looseleaf binder and approximately 17 chapters with separators. The various chapters are being printed separately as they are revised and will not necessarily appear in numerical order. Two chapters—Nursing and Nursing Procedures, and Pharmacology and Toxicology—are now available; Anatomy and Physiology will be available in the near future. Orders may be placed with Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Clinical Management of Leukemia. Haut, Wintrobe, and Cartwright present a current summary of clinical treatment of leukemia. They consider that empirical systems of treatment, employing chemical agents and radiation in a

manner specified for each type of leukemia, can relieve symptoms and offer the chance of an extended period of relative well-being to victims of the disease. (Amer J Med, May 1960)

Estrogens for Menopausal Symptoms. Not all menopausal symptoms are amenable to estrogen therapy—only amenorrhea and the flushes and sweats resulting from vasomotor instability can be related to estrogen depletion. A thorough medical evaluation should always precede initiation of estrogen therapy; also some psychologic appraisal is desirable. The physician who treats a patient with estrogens invites trouble if he fails to recognize the presence of such conditions as hyperthyroidism or involutional melancholia. Synthetic estrogens are just as effective as the natural ones, and injected estrogens have no advantage over oral ones other than for placebo effect. (The Medical Letter, May 27, 1960)

Tests for Pheochromocytoma. Pharmacologic and chemical tests are helpful in screening a large number of patients for pheochromocytoma and are a distinct aid to correct diagnosis. No one test is infallible, and knowledge concerning the drugs used or the manner in which the blood and urine are collected, or both, is necessary to avoid a false-positive result from the tests. This review summarizes the current status of pharmacologic and chemical tests available as aids in diagnosis of pheochromocytoma. (G. Roth, et al, Circulation, May 1960)

Percutaneous Transhepatic Cholangiography. Because the etiology of obstructive jaundice is often an unsolved problem before operation and, at times, even at laparotomy, the technique of percutaneous transhepatic cholangiography presents definite advantages and should take its proper place in the armamentarium of diagnostic procedures. If indications are strictly adhered to and technique carefully observed, the hazards are minimal and the information gained is rewarding. (A. Kaplan, et al, Amer J Dig Dis, May 1960)

Evaluation of Hepatic Function. Because of the properties of rapid exponential loss from the circulation and a large hepatic to extrahepatic extraction ratio of the dye, employment of indocyanine green provides an excellent and relatively simple means of assessing liver function. (B. Wiegand, et al, Amer J Dig Dis, May 1960)

Parathyroids and Gastric Secretion. The mechanism behind the apparently high incidence of peptic ulcer in primary hyperparathyroidism is obscure. Notwithstanding the stimulatory effects of acute hypercalcemia and parathyroid hormone, the unaltered secretion in the patients with hyperparathyroidism observed by the authors led them to believe that the ulcerogenic factor in this disease is not hypersecretion. (W. Donegan, H. Spiro, Gastroenterology, May 1960)

Exopthalmos-Producing Substance. After conducting experiments with exophthalmos-producing substance (EPS) on fish, the authors' findings confirm other reports that TSH and EPS are not identical. In the serum of patients, high EPS values were found in cases when the exophthalmos showed "malignant" features. High values were also obtained in the serum from patients with unilateral exophthalmos, although the reason for this unilateral response could not be explained. Pretibial myxedema, usually associated with severe exophthalmos, showed poor correlation with the level of EPS. (P. der Kinderen, et al, J Clin Encodr, May 1960)

Endarterectomy in Small Vessels. Performing animal studies to evaluate the results of experimental endarterectomy in systemic vessels of various size including those of a caliber comparable to the size of human coronary arteries, the authors demonstrated that endarterectomy may be performed on arteries of small diameter with expectation of continued patency. (D. Sabiston Jr, et al, Surg Gynec Obstet, May 1960)

Fluorescein String Test. The fluorescein string test is a recently described method for localization of upper gastrointestinal hemorrhage. It is superior to the conventional Einhorn string test because it permits rapid and precise localization of the bleeding site and makes it possible to determine whether active bleeding is occurring in the upper gastrointestinal tract at the time the test is performed. (W. Haynes Jr, F. Pittman, Gastroenterology, May 1960)

Diagnosis of Mesenteric Infarction. Delay in diagnosis of acute mesenteric vessel obstruction is an important cause of the high mortality. A technique, developed in animals, employing rapid intravenous injection of a bolus of I^{131} labeled human serum albumin and subsequent determinations of radioactivity over the abdomen, may be applicable to human subjects and give similarly accurate early diagnostic aid. Direct attack on the diseased vessel by corrective procedures may then result in restoration of a more physiologic status than can be obtained with extensive bowel resection. (K. Absolon, et al, Surg Gynec Obstet, May 1960)

Vascular Substitutes. Freeze-dry ethylene oxide sterilized aortic homografts and seamless Nylon aortic prostheses were implanted in the abdominal aorta of mongrel dogs and followed from 3-1/2 to 5 years. Even though degenerative changes had occurred in both types of grafts, from a clinical point of view the grafts functioned satisfactorily. Atherosclerotic deposits of lipids and calcium occurred in both types of vascular substitutes; in 2 of 12 homografts, mild aneurysmal dilatation occurred; among 11 synthetic prostheses, mural thrombi were formed in 3 and intimal defects in 9. It is apparent that neither substitute represents the ideal vascular replacement. (J. Foster, et al, Ann Surg, June 1960)

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Recent Research Reports

U. S. Naval Medical Research Institute, NNMC, Bethesda, Md.

1. Further Observations of Electronically Controlled Coronary Arteriography, Aortography, and Angiocardiography. Lecture and Review Series No. 60-1, 29 January 1960.
2. Differential Cardiac Hypothermia for Elective Cardioplegia. MR 005. 12-0002. 04, Report No. 3, 4 May 1960.
3. Myocardial Metabolism and Post Arrest Function in the Cold and Chemically Arrested Heart. MR 005. 12-0002. 04, Report No. 4, 4 May 1960.

U. S. Naval Air Development Center, Johnsville, Pa.

1. The Effect of Oxygen Deprivation on the X-Wave and B-Wave of the Human Electroretinogram. MR 005. 13-6002, Report No. 13, 29 March 1960.
2. Spectral Sensitivity of the Eye Based on Visual Acuity. MR 005. 13-6002. 1, Report No. 12, 26 April 1960.

U. S. Naval Medical Field Research Laboratory, Camp Lejeune, N. C.

1. Handling of Foot Care Problems in Recruit Training: A Compilation of Current Navy and Marine Corps Experience. MR 005. 12-6100. 1, March 1960.

U. S. Naval Medical Research Laboratory, Submarine Base, New London, Conn.

1. Red Lighting Survey Aboard the USS RANDOLPH (CVS 15). Memorandum Report 60-6, MR 005. 14-1100. 01. 07, 6 April 1960.
2. Evaluation of the Dunbar-Knight Hearing Guard. MR 005. 14-0200. 01. 01, 20 April 1960.
3. Field Evaluation of Experimental Model of Submarine Deck Exposure Suit. Memorandum Report No. 60-8, MR 005. 14-0001. 02, 4 May 1960.
4. Escapes from Sinking Jet Aircraft Cockpits. Memorandum Report No. 59-2, NM 24 03 20, 25 May 1960.

U. S. Naval Radiological Defense Laboratory, San Francisco, Calif.

1. Species Differences in Altitude Tolerance Following X-Irradiation. USNRDL-TR-377, 27 December 1959.
2. Late Effects of Fast Neutrons Versus X-Rays in Mice. USNRDL-TR-290, 2 January 1960.

U. S. Naval Medical Research Unit No. 2, Taipei, Taiwan

1. Nematode Parasites of Vertebrates of East Pakistan. I. Oxyuridae from Lizards (Gekko and Hemidactylus). Report No. 1, MR 005. 09-1601. 5, 23 March 1960.
2. Nematode Parasites of Vertebrates of East Pakistan. II. Amplicaecum ranae sp. nov. (Heterocheiliidae Railliet and Henry, 1915) from Amphibia. MR 005. 09-1601. 5, Report No. 2, 23 March 1960.

DENTAL SECTION

Device for Use During High Speed Procedures

Although the air-driven, water-spray turbine is used extensively for preparation of teeth, authors have failed to comment on the discomfort to the patient when it is used in preparing the labial surface of any of the upper six anterior teeth. Escape of air and spray into the nostrils and face frequently is startling to the patient. The force usually is sufficient to overcome the pressure of ordinary exhalation.

The solution is simple. Since a dental mirror usually is not necessary when the dentist operates on the labial surfaces of upper anterior teeth, the dentist can use his left hand to hold about a third of a sheet of wax under the nose of the patient. The sheet of wax can serve both as a deflector of air and spray and as a lip retractor. The wax may be notched or curved at one edge to fit the labial contour more closely. (R. L. Heinze, A Simple Device to Increase Patient Comfort During High Speed Procedures: New York State Dental Journal, 25: 424, November 1959)

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Dental Support of Fleet Marine Forces

Dental support is provided the combatant elements of the Marine Corps (Fleet Marine Force) by means of Force Dental Sections and Force Dental Companies.

The Force Dental Officer, supported by the Force Dental Section, provides the Commanding General with information and recommendations required for direction of the dental support to the Fleet Marine Force.

A Force Dental Company, commanded by an officer of the Dental Corps, is a professionally well balanced organization composed of Dental officers and technicians in sufficient strength to support a Marine Division, an Aircraft Wing, or Force Troops. The Company is designed to attain maximum utilization of dental manpower while providing the most effective and timely dental support to combat or other Fleet Marine Force Operations. The Force Dental Company, as a unit, does not normally take an active part in an initial landing or the early phases of a Marine combat operation. This, however, does not preclude the maxillofacial surgeon, oral surgeon, or other

dental personnel deemed necessary, from being attached to surgical teams on a temporary basis. Maximum dental service effort is concentrated where needed as soon as possible after a beachhead has been established or when reserve, supporting, replacement, or other units are free from combat operations.

The Force Dental Company's organization and equipment are designed to permit a considerable degree of flexibility and mobility. The Company is capable of being subdivided to support small units or to augment the strength of other Dental Companies. Its mobile equipment and flexible structures permit a wide selection of locations from which dental service can be provided.

Force Dental Companies, organic to a Fleet Marine Force, are responsible to directives of the Force Commander. Each Fleet Marine Force has sufficient Dental Companies to assign one to support each Division, Aircraft Wing, and Force Troops in the Force. While so assigned, the Companies are under the military command of the Division, Wing, or Force Troops Commander

The Commanding Officer of a Force Dental Company also serves as a Special Staff Officer on the Staff of any command below Force level to which assigned. In the latter capacity he is directly responsible to the Commander of the Division, Wing, or Force Troops to which assigned for all professional, technical, and administrative matters pertaining to the dental health of the command. He recommends the most effective employment of dental personnel and equipment, and coordinates with the Medical Officer of the command for temporary integration of dental personnel and equipment to assist in care, treatment, and evacuation of casualties in combat and disaster.

Prior to reporting to a Dental Company for duty, all enlisted men and many of the officers complete the course at the Field Medical Service School. Upon reporting to the Dental Company, all personnel are indoctrinated in the assembly and use of field equipment. The Dental Company conducts field exercises at stated intervals. Every effort is made to make the Casualty Care Course available to dental personnel. To insure a constant state of readiness, deteriorative items are rotated through the Basic Field Outfits and Supply Blocks. Technical and field gear are in the custody of the Dental Company and are kept in a constant state of readiness.

Dental officers who have been and are being trained in military operational planning at the Amphibious Warfare School, Senior Course, may be assigned as Commanding Officer of a Force Dental Company.

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NOTE: In the Dental Section of the Medical News Letter, Vol. 35, No. 8, p. 37, recommendation (4) of the article, Resuscitators in Dental Clinics, should read: "The simplest measures such as bag, mask, and oxygen supply should be available."

Procurement of Artificial Teeth

Open-end contracts for the local procurement of artificial teeth in fiscal year 1961 have been mailed to all ships and stations having authorized prosthetic facilities. Additional copies or additional information pertaining to these contracts may be obtained from Chief, Field Branch, Bureau of Medicine and Surgery, 3rd Avenue and 29th Sts., Brooklyn 32, N. Y., Attn: Code 42B.

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Newly Standardized Dental Item

In order to fulfill a requirement for an aspirating syringe for use with local anesthetic solutions packaged in glass cartridges of 1.8 ml capacity, the following item has been standardized:

Stock Number	Item Identification	Unit of Issue	Unit Price
6515-619-8918	Syringe, Cartridge, Aspirating, Thumb Ring Handle: With one long hub, one short hub, and two harpoons. For needles, order Index No. 7305 and 7310. For use with lidocaine hydrochloride injection, 6505-261-7240 and 6505-576-8842.	Each	$6.30

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Dental Silver Alloy Powder

During the past year, numerous complaints have been received in the Field Branch, Bureau of Medicine and Surgery, on dental silver alloy powder, FSN 6520-500-2050, involving stocks manufactured by General Refineries Inc. and H. Jelineck.

During this period, the Military Medical Supply Agency laboratory did not have personnel qualified to examine this material. Consequently, samples of allegedly defective material and copies of complaints were forwarded to the National Bureau of Standards for testing. The results of this testing indicated that samples (manufactured by General Refineries Inc.) met well the requirements of the Federal Specification U-S-350a. (Note: Due to the similarity of complaints only one manufacturer's material was initially tested.) Despite compliance with specifications, the complaints, well documented by more than one dentist in each activity, indicated that the alloy is professionally unacceptable for use. In view of the NBS testing results and volume of complaints, a request for professional evaluation and acceptability

has been referred to higher authority. Further action by the Field Branch will depend upon the recommendation received as to additional testing, if any is desired. Activities will be advised of further developments.

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Personnel and Professional Notes

CAPT Gerry Presents Paper. CAPT Roger G. Gerry DC USN, Chief of Dental Service, U.S. Naval Hospital, St. Albans, N.Y., recently presented a paper—Alveoplasty and Genioplasty—at the Spring Meeting of the Metropolitan New York Society of Oral Surgeons which had as general topic, Cosmetic Oral Surgery.

CAPT Losee Lectures. On invitation, CAPT F. L. Losee DC USN recently presented a series of lectures on dental caries and response of osseous tissues to ethylene-diamine treated bone in oral and orthopedic sites before the Australian Dental Association. CAPT Losee is assigned to the staff of the Naval Medical Research Institute, National Naval Medical Center, and is currently on extended duty conducting research at the University of Otago, Dunedin, New Zealand.

Eleventh Naval District Professional Meeting. A professional meeting, sponsored by the Dental officers of the 11th Naval District, and honoring the San Diego County Dental Society, was held at the U.S. Naval Training Center, San Diego, 20 June 1960. The meeting was followed by a social hour and dinner after which CAPT B. W. Oesterling DC USN (Ret) presented a comparison of the pin-dowel and clasp partial dentures with special emphasis on diagnosis and construction.

Table clinics were presented by: CAPT Walter W. Crowe and staff, U.S. Naval Hospital, San Diego—Treatment of Maxillo-Facial Fractures; CAPT Irwin Gullett, U.S. Naval Dental Clinic, Camp Pendleton—Occlusal Rests—A New Concept; CDR Kimble A. Traeger, CDR Frank J. Brauer, Marine Corps Recruit Depot, San Diego—Dental Rehabilitation of Recruits at Marine Corps Recruit Depot, San Diego; LCDR Joseph E. Hartnett, LT James R. Buntain, U.S. Naval Training Center, San Diego—Remount Procedures for Complete and Partial Dentures; and LT Burton L. Shapiro, Naval Station, San Diego— Indications and Instrumentation for Apical Surgery in Endodontia.

A closed circuit television group clinic, Partial Dentures Compatible with the Periodontium, was presented by Dental officers attached to the U.S. Naval Training Center, San Diego. Those participating were: CAPT Glenn D. Richardson, LCDR Ernest E. Davies, LT Jacob J. Lippert, and LT Leonard E. Mark.

El Toro Dental Officers - Hosts to Dental Society. The Dental officers of the Dental Department, U.S. Marine Corps Air Station, El Toro (Santa Ana), Calif., were hosts to the Orange County Dental Society at the annual dinner and professional meeting held recently. CAPT R. D. Koepke, Station Dental Officer, was in charge of the meeting at which J. B. Davidson, President of the Los Angeles Adventurers Club was guest speaker. In addition, table clinics were presented by: CAPT M. E. Lyons—Simplified Procedures for Class V Gold Foil Restorations Using Mat Gold Technique; CDR L. P. Sharp—Flap Technique in Routine Surgical Procedures - a Report of Unusual Cases; LCDR M. Zustiak—Functional and Esthetic Postoperative Acrylic Splints for Gingivectomy Patients.

CAPT Turville Commended. CAPT A. S. Turville DC USN, Chief of Dental Service, U.S. Naval Hospital, Oakland, Calif., was recently commended by RADM R. W. Taylor DC USN, Inspector, Naval Dental Activities, Pacific Coast. The commendation read:

> "Upon two separate occasions you have demonstrated your outstanding personal qualifications in leadership both militarily and professionally. Initially, you organized and presented the first 'In-Service Naval Training Program' to be presented in the Twelfth Naval District. More recently, you again willingly assumed the responsibilities in connection with organizing and conducting the first 'U.S. Navy Dental Corps Casualty Treatment Training Program' to be presented in the Twelfth Naval District. Both programs, sponsored by the Bureau of Medicine and Surgery, proved to be remarkably successful, reflecting credit to the U.S. Navy Medical Department and Dental Corps.
>
> It is a pleasure to transmit the appreciation of the Dental officers of the Twelfth Naval District and to add my commendation for a task superbly executed and well done."

CWO Triegloff Awarded Church Honors. Chief Dental Service Warrant Officer Albert Triegloff USN, Administrative Command, U.S. Naval Training Center, Great Lakes, Ill., was recently presented the Celtic Cross award and the title, "Churchman of the Year," at the Forrestal Community Church. The Celtic Cross award was given for services performed while serving as assistant superintendent of the Sunday School; the "Churchman of the Year" title for the area was awarded by the Church Federation of Greater Chicago. As Chairman of the Plank Ownership Committee, Mr. Triegloff supervised the raising of funds from all Protestant families in the local naval housing areas. Supplemented by $120,000 outside financial aid furnished by the Presbyterian Church, the money will build the new Forrestal Church and Educational Building.

RESERVE SECTION

Amphibious Medical Indoctrination Course

A course in Amphibious Medical Indoctrination will convene on 8 August 1960 at the Naval Amphibious School, U. S. Naval Amphibious Base, Little Creek, Norfolk, Va.

This course indoctrinates male officers and enlisted personnel of the Reserve Medical Department in the basic fundamentals of Amphibious Warfare and associated medical duties. By a series of lectures, demonstrations, training aids, tours and practical work, the trainee is introduced to Amphibious Warfare and the medical problems that arise during an amphibious operation.

Inactive Naval Reserve male Medical Department personnel are eligible to attend. Quotas have been allocated to the First, Third, Fourth, Fifth, Sixth, Eighth, and Ninth Naval Districts.

A similar two-week course convening any Monday morning is available at the Naval Amphibious School, U. S. Naval Amphibious Base, Coronado, San Diego, Calif; quotas have been allocated to the Ninth, Eleventh, Twelfth, and Thirteenth Naval Districts.

Uniforms suitable for participating in landing exercises are required. Security clearance is not required.

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Letters to the Bureau

Assignment to a Drill Pay Unit

". . . I am currently deferred from active duty under the Berry Plan until completion of residency training.

I am at present under Naval Reserve inactive duty training orders assigned to (a) Naval Reserve Medical Specialist Unit. . . .

I shall be grateful if you will kindly inform me of any available pay billets in (a specific area). . . ."—A. V. K.

Inasmuch as you are currently deferred from call to active duty under the Armed Forces Reserve Medical Officer Commissioning and Residency Consideration Program, and assignment to a drill pay unit would place you in a Ready Reserve status within the Selected Reserve, current policy precludes your attachment to any drill pay unit of the Naval Reserve.

There is no objection, however, to your continuing your training in a non-pay status. As you may know, assignment to drilling units is a matter within the cognizance of the Commandant of your Naval District, and if you desire a non-pay billet in that area, your request should be submitted to him.

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Promotion Plan for Inactive Duty Naval Reserve Officers

(Concluding installment of article appearing in News Letters dated 17 June and 1 July 1960)

4. Appointment

When an officer has fulfilled the professional requirements and has been found physically qualified, he must address a letter to the Chief of Naval Personnel via the command that maintains his record requesting that an appointment to the next higher grade be issued him. It is necessary that he state the dates on which he qualified professionally, as well as physically, in the official letter of request. During the period when the selectee is qualifying, the Bureau of Naval Personnel is constantly checking to ascertain if a vacancy has been established for the selectee's running mate. If a vacancy has occurred for the running mate of the selectee, the selectee's running mate has made his number, then the selectee may be appointed, if qualified, to the next higher grade, and he will receive the same date of rank. In no case will a selectee be appointed to the next higher grade until a vacancy has been established for his running mate. In some cases, because of this requirement, it is necessary for a selectee who has actively participated in the Reserve program, and is fully qualified, to wait several months after he has originated his request before he is issued an appointment to the next higher grade. All appointments issued are for temporary promotion, and a permanent commission is issued only when his running mate is eligible to receive a permanent commission.

The temporary appointment is mailed to the qualified selectee via the command that maintains his record, and he endorses it to the officer concerned. It is only after the selectee has executed the acceptance that he is eligible to assume the title of the next higher grade.

In Summation

The entire selection process is a very complicated process and the Navy spends many thousands of dollars each year to make certain that all eligible persons are treated in as fair and impartial a manner as is physically possible. Many counter checks are employed to assure that the records of all eligible candidates are considered by the designated board. Promotions above

the grade of lieutenant (junior grade) can only be made as a result of a selection board recommendation.

There is one important thought you should never forget - when the time comes that your name and records appear before a selection board, just relax, because it's then too late for you to do anything about it. The members of your board take over at that point and your fate is in their hands.

For additional information the following BuPers Instructions are recommended:

1412.1D Promotion of Naval Reserve officers to grades above lieutenant (junior grade) pursuant to Chapter 549 or Title 10, U.S. Code.

1412.10A Promotion of Naval Reserve ensigns pursuant to the "Reserve Officer Personnel Act of 1954".

1416.4B Professional fitness for promotion of Naval Reserve officers not on active duty.

NOTE: New regulations, approved by SecNav, will soon require that all officers on inactive duty—including captains—earn an average of 12 promotion points for each year in grade in order to be eligible for consideration for promotion. These promotion points must be earned before the beginning of the fiscal year in which an officer is in the established promotion zone or otherwise eligible for promotion. However, no officer will be required to earn more than 72 promotion points.

The new requirement is in addition to the regulation that an officer be in an active status.

As a further requirement, officers who are selected for promotion will be given only one fiscal year—following the fiscal year in which selected—to qualify for promotion. Currently, officers have a two-year period in which to qualify.

The promotion point requirements for accepting appointment are unchanged.

The new requirements are expected to stimulate greater participation in the Reserve program.

The change in policy will become effective on 1 July 1961 for eligibility for consideration by fiscal year 1962 and subsequent selection boards. Exemptions from the promotion point requirement are as set forth in BuPers Instruction 1412.1D.

(Particular appreciation is expressed to the Promotions Branch, Bureau of Naval Personnel, for permission to publish this information.)

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OCCUPATIONAL MEDICINE

The Use of Detectors and Test Kits in Industrial Hygiene Investigations

When one reviews the continuous progress being made in the field of industrial hygiene, it soon becomes apparent that a contributing factor to this progress has been acquisition of much needed data through improvements made in air sampling instruments.

Although detectors and test kits embrace a broad category of sampling devices, the basic instrument to be discussed here consists of two parts: (a) the sampler, or mechanical device for drawing the air to be tested through the detecting or collecting medium, and (b) the detecting or collecting medium.

The principal types of samplers are: (1) electrical pumps, (2) metal hand pumps, (3) gas aspirating devices, (4) rubber bulbs or bellows, and (5) glass syringes. All of these devices are usually calibrated in advance and are intended to be used in a manner that will cause a known volume of air to pass through the detecting medium.

The most widely used types of detecting or collecting mediums consist of: (1) prepared solutions, (2) special papers or filters impregnated with selected reagents in advance or at the sampling site, and (3) solid granules such as silica gel, diatomaceous earth, or alumina impregnated with selected reagents. Detecting mediums usually function by developing a color, the intensity of which is proportional to the atmospheric concentration of the airborne material. In some instruments, depending upon the volume of air sample, concentration is indicated by the length of the stain formed in the detecting tube.

Management indirectly promotes use of detectors and test kits by its own increasing knowledge of industrial health problems. It has learned to rely more and more on scientific methods that can be brought to bear upon solution of problems in production and expects the same diligent application to industrial hygiene problems. An enlightened management now asks and wants to know: "What is exposure? Is it continuous? How harmful is it? Can it be measured?" The last question poses the challenge to obtain data because data establish a point from which to proceed.

At the same time, management is much more alert to, and aware of, the rising costs of installations including extensive exhaust ventilating systems. In this area especially, it is not apt to be swayed by opinion as much as to be convinced by facts.

Detectors and test kits furnish immediate information on hazardous conditions. In the course of any industrial hygiene investigation, there is a certain amount of impatience frequently expressed in waiting for laboratory findings on air samples collected in the field. As a result, many field investigators prefer to use detectors and test kits instead of conventional air sampling and analysis procedures. It must be admitted there are a number of advantages to "on the spot" data, especially when applied to extremely toxic substances that are odorless or possess odors that are not unpleasant when inhaled. For example, workers may be exposed to hazardous concentrations of arsine, carbon monoxide, hydrogen cyanide, nickel carbonyl, aniline, nitrobenzene, inorganic compounds of toxic heavy metals, certain halogenated hydrocarbons, et cetera, without experiencing immediate discomfort. Other gases and vapors may cause varying degrees of annoyance, but are not necessarily disabling until a sufficient quantity has been inhaled. In this category are oxides of nitrogen, certain nitriles, hydrogen sulfide, phosgene, and others.

It is through the use of detectors and test kits that dangerously high concentrations of airborne substances can be found immediately and appropriate corrective measures taken. It is encouraging to find such progress being made and it would be even more assuring to have "on the spot" methods available for all highly toxic airborne dusts, gases, vapors, and mists.

Although current Maximum Allowable Concentration values are associated with 8-hour exposures, there is a fallacy in assuming that all exposures are continuous over an 8-hour period. Intermittent exposures to airborne dusts, gases, vapors, and mists probably occur more often in industry than do continuous exposures. Should any findings ultimately disclose that information on high intermittent concentrations is valuable and denotes good industrial hygiene practice, greater reliance will have to be placed upon detectors and test kits. The implication should be emphasized—our sampling techniques may have to be revised. This does not mean eliminating all concepts of conventional air sampling, but it does mean that methods that will satisfy these new requirements through use of rapid testing field instruments may have to be included.

The picture that has been presented on use of detectors and test kits for industrial hygiene investigation, thus far, has been favorable. However, we would be remiss in our responsibilities as hygienists if we ignored certain conditions under which use of detectors and test kits for field determinations might have certain drawbacks.

For example, if an investigator does not approach a problem in an experienced manner and he uses a kit that has no professional appearance, his efforts may only succeed in causing loss of respect for his own ability and the kit's capability of performing an important function. Indeed, casual use of a detector or test kit could convey the impression that a few squeezes of a rubber bulb and a quick glance at a color chart are all that is required

to solve what may really be a complex problem in environmental health. Simplification in performance of a difficult test is really appreciated only by those who are aware of the complexities. Moreover, indiscriminate recommendation of detectors and test kits may result in too many kits getting into the hands of inexperienced personnel who, in turn, may put them to ridiculous uses. Following acquisition of data, the resulting course of action may cause more consternation than if the kit had not been used at all. Suppliers of detectors and test kits are continually making claims that nontrained and inexperienced personnel will have no difficulty in using the kits. However, experience indicates that it would certainly be better to at least have a trained person monitor their use in any extensive program.

Even assuming that test kits find their way into the hands of inexperienced, yet responsible and conscientious, personnel, the sampling location, the proper time to sample, and the number of samples to be taken are details that have considerable bearing upon the outcome of the investigation.

In addition, the chemical and mechanical aspect of test kit usage should be thoroughly understood. A combination of gases and vapors may give erroneous results when the test is being made for only one. It is certainly the responsibility of manufacturers to point out all possible interferences with a test at least to the best of their knowledge. Even the NBS carbon monoxide indicator, one of the best detectors ever developed, is subject to interference from oxides of nitrogen under certain conditions of use.

Last but not least, interpretation of air sampling results must reflect an experienced approach to industrial hygiene problems that manifest need for investigation. As indicated above, much more goes into the picture presented to management than a few tubes of colored granules or strips of stained paper. Management, which pays the bills, deserves the assurance that the proper tests have been selected so that results are not additive.

It must be remembered that when we hold an air sampling device in our hands, we may also hold the life of a fellow human being. They both deserve the best we have to offer. (J. B. Gisclard, The Use of Detectors and Test Kits in Industrial Hygiene Investigations: AMA Arch Industr Health, 21: 250-260, March 1960)

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Autografts of Bone Marrow in Dogs After Lethal Total-Body Radiation

Alpen and Baum have shown that infusions of autologous marrow induce recovery in dogs after exposure of the entire body to 400 or 600 r of 250 kv x-rays. The purpose of this communication is to report that recovery in dogs can be induced promptly by autologous marrow infusion after exposure to x-ray or gamma radiation in dosages up to 1500 r. Both bone marrow and lymphoid

tissue are restored. The restoration of the latter tissue is of an order not yet obtained with homologous marrow in this species after similar amounts of irradiation.

Material and Methods

Eight purebred beagle dogs were used as experimental animals, two were male and six female. The dogs were between 5 and 18 months old and weighed from 6 to 8 Kg. They were caged separately or in pairs in a general animal room and were exposed, because of a transient population of sick dogs, to the same seasonal canine disorders as the group of dogs grafted with homologous marrow previously reported from this laboratory. Prior to radiation, all dogs were dewormed and actively immunized against distemper and hepatitis by attenuated vaccine.

Dogs were kept fasting on the day of irradiation and were fed only ground beef on the evening before in order to insure a minimum of osseous and other calcium-containing material in the gut at the time of irradiation. All animals were given daily intramuscular injections of 400,000 units of procaine penicillin and 0.5 Gm streptomycin beginning on the day of irradiation and continuing for at least 7 days thereafter. Other antibiotics, parenteral fluid therapy, fresh blood transfusions, and dog hyperimmune serum were used as required.

Baseline determinations of hemoglobin concentration, hematocrit, white blood cell count, differential count, reticulocyte count, and platelet count were performed on all animals prior to irradiation and were repeated on the sixth or seventh day after irradiation and thereafter at biweekly intervals until full hematologic recovery had occurred.

Serum samples for filter paper electrophoresis were drawn on four of the eight dogs prior to irradiation and at 2 weeks following irradiation. Samples were drawn on all dogs at one month and 2 months following irradiation.

Irradiation was given by two methods:

Method 1. Dogs were anesthetized with intravenous pentobarbital sodium (25 mg/Kg) and placed under a standard 250 kvp x-ray therapy machine. Target distance was 100 cm to midline of the animal. Dose rate was 5 r/min in air at theoretical midline with filters 0.25 mm Sn, 0.4 mm Cu and 1.0 mm Al, HVL 2.2 mm Cu, 250 kvp and 10 ma. Animals were turned after each 100 r so as to expose both sides to the same amount of radiation.

Four dogs were irradiated by this method. Dogs 65 and 54 received 600 r as a single dose. Dog 82 received 800 r as a single dose, and dog 83 received 800 r in divided doses of 400 r each at a 24-hour interval.

Method 2. Dogs in a plywood cage with no metal parts were placed between two Co^{60} sources. No anesthesia was used. Target distances were 2.0 and 2.3 meters. Three 1/4 inch lead plates were used as filters for each source. Dose rate from each was 0.9 r/min in air at midline subject; total air dose, 1.8 r/min.

Four dogs were irradiated by this method. Dog 95 received 1000 r as a continuous dose; dog 94, 1200 r; dog 128, 1300 r; and dog 111, 1500 r.

Autologous bone marrow was obtained immediately prior to irradiation. Under anesthesia an incision was made over the lateral cortex of the femur. A rectangular window was cut in the cortex approximately 2.5 by 0.5 cm. The exposed marrow was aspirated through a cannula into a suction flask.

The aspirated marrow was processed immediately through screened syringes as described by Thomas, and stored, still suspended in heparinized TC-199, at 4 C until ready for use. Total nucleated cell counts were made immediately after processing. Marrow yield in this series ranged from 1.4 to 3.7 billion nucleated cells.

The marrow suspensions were warmed and given back to the dogs by the intravenous route as soon as irradiation was completed.

Results

All dogs survived irradiation for 39 days or more. This was in contrast to control dogs in this laboratory which showed a 100% 15-day mortality after an air dose of 600 r total-body irradiation.

Clinical Course. In this series, no correlation could be made between an animal's clinical course and the dose of radiation administered. Dogs 65 and 111 received 600 r and 1500 r, respectively, and made the most benign recoveries. Similarly, there was no apparent correlation of clinical behavior with the quantity of marrow injected.

The immediate clinical response to irradiation was mild. Dogs 2 and 3 received 800 r of 250 kvp x-ray and had mild anorexia for 24 to 48 hours after irradiation. There was no instance of the gastrointestinal syndrome described by Conard et al. Rectal temperature customarily remained in the normal range until the sixth and seventh day after irradiation. Then it was invariably elevated a degree or more for a variable period. Weight began to fall at this time, and all except dog 65 developed respiratory infections, usually of a mixed bacterial type that required antibiotic therapy for 2 to 4 weeks. All except dogs 65 and 111 received parenteral fluid therapy during this period. Dogs 82, 83, and 94 received one or more injections of hyperimmune dog serum and dog gamma globulin while infection was clinically manifest. Dog 95 received fresh blood transfusions from an unrelated donor because of petechial hemorrhages in the gums. By the twentieth day after irradiation all dogs had improved clinically. Temperatures returned to normal levels; the dogs appeared well and active and began to gain weight. Dogs 65, 83, 95, 111, and 128 have continued to appear well since that time.

Dog 82 developed an upper respiratory infection on the twenty-ninth day post-irradiation, followed by bacterial pneumonitis and death from convulsion on the thirty-ninth day.

Dog 94 developed intestinal obstruction on the eighty-third day from an adhesion formed at a previous laparotomy and died on the eight-fourth day.

Six weeks after irradiation, dog 54 developed a syndrome of weight loss, voracious appetite, and copious foul-smelling stools containing grossly undigested food. A tentative diagnosis of pancreatic insufficiency was made, and the animal was placed on oral pancreatic enzyme. Gastrointestinal function returned to normal, and the dog regained weight. After 3 weeks, treatment was discontinued and the syndrome recurred. Therapy was resumed and is being continued at the present time. The other five surviving dogs have given no evidence of this or any other illness.

The clinical behavior of this group of dogs is strikingly different from that of a group of similarly irradiated dogs receiving homologous marrow, reported previously from this laboratory.

Whereas five of the eight dogs in the autologous series have remained entirely well, dogs in the homologous series have lost weight, been intermittently febrile, and have usually died of viral, bacterial, or parasitic disease before 100 days postirradiation.

Hematology. White blood counts fell rapidly after radiation, reaching a nadir at 6 or 7 days and then rose gradually, beginning at about the tenth day. Normal levels were usually attained between the twentieth and twenty-fifth days. During the early part of the recovery period, differential counts showed a preponderance of polymorphonuclear leukocytes with many young forms and the frequent appearance of nucleated red blood cells. Lymphocytes usually did not appear in significant numbers until nearly the thirtieth day. Differentials returned to normal between 30 and 40 days.

Platelet counts in this series diminished at about the same rate as the white blood count, reaching their lowest levels between 7 and 10 days. Recovery was more gradual, however, and normal levels were reached about the thirty-fifth day.

Reticulocyte counts fell from normal levels to zero by the seventh day, and an elevation was usually not apparent until the fourteenth or fifteenth day. Counts remained elevated usually until about the thirtieth day, a time roughly corresponding to the return of hemoglobin values to normal.

Dog 82 that expired on the thirty-ninth day had demonstrated the expected return of all hematologic parameters to normal except for an essential absence of lymphocytes from the differential white blood count. A similar failure of lymphocyte counts to return to normal was observed in the series of homologous marrow grafted dogs.

Histologic Studies of Lymph Nodes. The lymph nodes excised from the dogs that received infusions of their own marrow were compared histologically with the nodes removed at postmortem from previously reported dogs that received similar amounts of radiation and homologous marrow. Comparisons were made between nodes removed at similar time intervals

following irradiation. If there was histologic evidence of local infection, the node was excluded from the comparative series.

In the homologous series, the nodes from dog 2 showed no lymph follicles and no aggregates of lymphocytes 9 days after irradiation. Isolated lymphocytes were present. Sinusoids contained many red cells, and the cytoplasm of the lining reticuloendothelial cells was filled with phagocytized red cells. In the autologous series, a lymph node removed at 10 days from dog 95 showed similar changes in the sinusoids plus large numbers of plasma cells in the connective tissue septa. The cortical portions of the node, however, contained many immature and mature lymphocytes which were grouped in foci suggestive of a follicular pattern.

Discussion

The results of the present experiment confirm in the dog the generally accepted thesis that a graft of autologous marrow produces a less stormy and more certain recovery from supralethal irradiation than does a similar graft of homologous marrow. The superiority of autologous marrow appears related to the fact that autologous grafts repopulate lymphoid tissue as well as bone marrow and promote recovery of normal immunologic activity as well as marrow function. The dogs with autologous grafts survived exposure to endemic disease. The dogs given homologous marrow did not. The dogs treated with autologous marrow showed a return of normal quantities of circulating lymphocytes. The dogs treated with homologous marrow showed a return to normal of all hematologic measurements other than the lymphocyte count. The lymph nodes of the dogs in the autologous series showed a rapid return of normal histologic appearance; the nodes in the homologous series failed to show comparable recovery. The gamma globulin patterns on serum electrophoresis returned to normal after irradiation in the autologous series; in the homologous series, the gamma globulins remained diminished.

In discussing the results of homologous marrow transplants in dogs in a previous report from this laboratory, it was suggested that the failure to restore lymphoid structures and resistance to disease might be the result of: (a) too much x-ray, (b) a "foreign marrow reaction," or (c) that in the dog, adult marrow might be a poor source of cells of the type needed to repopulate lymph nodes and splenic follicles. The normal restoration of lymphoid tissue observed in the present series of autologous marrow transplants disposes of possibilities (a) and (c) and emphasizes "foreign marrow reaction" as the cause of the abnormalities observed in the lymphoid tissue of the dogs receiving homologous marrow.

It is possible that the lymph node recovery observed in the autologous series represented regrowth of cells that were not destroyed at the time of irradiation. This possibility seems unlikely. Equal recoveries were observed irrespective of radiation dose in the range 800 to 1500 r. It appears more

likely that recovery was due to the repopulation of lymph nodes by cells infused with the marrow. This restoration excludes the possibility that failure after homologous marrow might be caused by a direct radiation effect upon the structural framework of the node. In mice a higher dose of marrow cells is required for successful transplants of homologous marrow than is required for autologous transplants. A similar dose effect may be involved in the repopulation of dog lymph nodes. However, a large body of evidence suggests that the deficiencies observed in the nodes are the consequence of a "foreign marrow reaction." Immunologically effective lymphoid cells present in the donor's marrow "home" to the lymphoid structures of the host and there react with host tissue antigens. This reaction of the graft against the host impairs recovery of normal population and structure.

In the observations presented the implications for the treatment of radiation injury in man are obvious. Transplants of autologous marrow have been shown to be effective treatment of supralethal radiation exposures in the dog. Transplants of autologous marrow have been found to be effective treatment for exposures of 800 to 1100 r in man. Satisfactory methods for the collection and preservation of human bone marrow are available. Consideration might, therefore, be given the establishment of autologous marrow banks for personnel potentially exposed to radiation and for patients about to receive consequential radiation or chemotherapy. (J. A. Mannick, et al, Autografts of Bone Marrow in Dogs After Lethal Total-Body Radiation: Blood, 152: 255-266, February 1960)

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